

1 **A METHOD AND SYSTEM FOR LOCATING**
2 **POSITION FOR A MOBILE COMMUNICATION DEVICE**

3 **FIELD OF THE INVENTION**

4 The present invention relates to locating position for a mobile communication device.
5 More particularly, it relates to locating position for a mobile communication device in
6 mobile commerce.

7 **BACKGROUND OF THE INVENTION**

8 With the advent of mobile commerce, position dependent information service (PDIS)
9 plays a key role in providing position information for mobile PvC devices (such as
10 WAP-enabled phones and PDAs). Position locating for these devices becomes a first step
11 towards supporting PDIS and is an indispensable component in mobile commerce. As is
12 well known for those skilled in the art, a position can be located either in the device side
13 or in the service provider side. An example for the former is a GPS receiver embedded
14 device which can send their geolocation to a server via a (latitude, longitude) pair, and an
15 example for the latter is a GSM operator (machine) which can determine the position of a
16 mobile phone user in a cell scale. But the rare GPS embedded PvC devices and the
17 complexity introduced in the operator prevent these locating mechanism being used
18 popularly.

19 **SUMMARY OF THE INVENTION**

20 The present invention provides methods, apparatus and systems for locating position for
21 a mobile communication device in mobile commerce. The methods and systems locate a

1 position based on the cooperation between a device user and a server. These methods and
2 systems facilitate a user inputting their geo-related text called geo-indicators to a server
3 which can locate the user's position by employing geocoding technology and spatial
4 database extensively.

5 According to one aspect of the present invention, there is provided an example of a
6 method for locating position for a mobile communication device in mobile commerce,
7 said step comprising inputting geo-indicators (Gi-1, Gi-2, ..., Gi-n) based on text by a
8 user with the mobile communication device; transmitting the geo-indicators to a back end
9 server; generating a candidate feature set for each geo-indicator by applying geocoding
10 which maps the text address to a geolocation based on a back end spatial database;
11 deciding the final geo-location information by geoclustering the candidate feature set; and
12 transmitting the geo-location information to the mobile communication device.

13 According to a further aspect of the present invention, there is provided an example of a
14 system for locating position for a mobile communication device in mobile commerce,
15 said system comprising a mobile communication device for inputting geo-indicators
16 (Gi-1, Gi-2, ..., Gi-n) based on text; geo-location generating means for generating a
17 candidate feature set for each geo-indicator by applying geocoding which maps the text
18 address to geo-location based on a back end spatial database; and clustering means for
19 deciding the final geolocation information by geoclustering the candidate feature set.

20 BRIEF DESCRIPTION OF DRAWINGS

21 The advantages and features of the present invention will become more apparent by the
22 following description of the advantageous embodiment of the present invention, with
23 reference to the drawings, in which:

1 Fig. 1 is an example of a flow chart illustrating a process of locating position for a mobile
2 communication device according to an example embodiment of the present invention;

3 Fig. 2 is a schematic view of an example of a system for locating position for a mobile
4 communication device according to the example embodiment of the present invention;
5 and

6 Fig. 3 is a flow chart illustrating an example of a process of locating position for a mobile
7 communication device according to another advantageous embodiment of the present
8 invention.

9 **DESCRIPTION OF THE INVENTION**

10 The present invention provides apparatus, methods and systems for locating position for
11 a mobile communication device in mobile commerce. These apparatus, methods and
12 systems locate a position based on the cooperation between a device user and a server.
13 This overcomes the disadvantages of other position locating methods, without a GPS
14 receiver being embedded in the device and without the complexity introduced in the
15 server. These methods and systems facilitate a user inputting their geo-related text called
16 geo-indicators to a server which can locate the user's position by employing geocoding
17 technology and spatial database extensively. According to one aspect of the present
18 invention, there is provided a method for locating position for a mobile communication
19 device in mobile commerce, said step comprising inputting geo-indicators (Gi-1, Gi-2,
20 ..., Gi-n) based on text by a user with the mobile communication device; transmitting the
21 geo-indicators to a back end server; generating a candidate feature set for each
22 geo-indicator by applying geocoding which maps the text address to a geolocation based
23 on a back end spatial database; deciding the final geo-location information by

1 geoclustering the candidate feature set; and transmitting the geo-location information to
2 the mobile communication device.

3 The present invention also provides a system for locating position for a mobile
4 communication device in mobile commerce. An example embodiment of a system
5 includes a mobile communication device for inputting geo-indicators (Gi-1, Gi-2, ...,
6 Gi-n) based on text; geo-location generating means for generating a candidate feature set
7 for each geo-indicator by applying geocoding which maps the text address to geo-location
8 based on a back end spatial database; and clustering means for deciding the final geo-
9 location information by geoclustering the candidate feature set. The methods and
10 systems according to the present invention have no need for additional embedded devices
11 in PvC devices, and have no need for special training for the user of the PvC devices to
12 effectively locate the position.

13 Advantageous embodiments of the present invention are now described in detail with
14 reference to the drawings. Fig. 1 shows a process of locating position for a mobile
15 communication device according to an advantageous embodiment of the present
16 invention. As shown in Fig. 1, at step S102, a user inputs a geo-related text through a
17 mobile communication device, such as a WAP-enabled phone and a PDA. The
18 geo-related text could be a street name, a building name, a postal code and a telephone
19 number. At step S103, the geo-related text inputted by the user is formalized into a vector
20 of geo-indicators (Gi-1, Gi-2, ..., Gi-n), where Gi-j could be a street name, a building
21 name, a postal code and a telephone number. The number of geo-indicators n is
22 preferably 1-3. It should be noted that Gi-j could be an abbreviation of an exact name.
23 Supporting abbreviation is a key feature of LBT of the present invention, which can
24 largely simplify the character-inputting task in a mobile phone, especially in Chinese
25 character context. At step S104, the geo-indicators are transmitted to a back end server.
26 After receiving the geo-indicators, the back end server generates a candidate feature set

1 (CFS) for each geo-indicator by applying geocoding. This step is based on the mapping
2 of a text address to a geo-location based on a back end spatial database. In this step, an
3 important task is to expand a received abbreviation to obtain several potential candidate
4 features (CF). CFS could be a set of points determined by an abbreviated building name,
5 a set of lines determined by an abbreviated road name, or a polygon determined by a
6 postal code or a prefix of a telephone number which always show regional characteristics.
7 At step S106, each CFS is labeled with a confidence level which is the quantity computed
8 from corresponding CF data set in the spatial database. At last, at step S107, the final
9 geo-location information is determined by geoclustering the candidate feature set. The
10 geometry relationship (such as distance, contain, intersect, etc.) and the confidence level
11 are taken into account when geoclustering the candidate feature set. The geoclustering
12 algorithm exploits the spatial database spatial functions and selects a result feature in the
13 winning cluster.

14 As above, the process of locating position for a mobile communication device according
15 to an advantageous embodiment of the present invention has been described with
16 reference to Fig. 1. A system for locating position for a mobile communication device
17 will now be described with reference to Fig. 2. As shown in Fig. 2, the system is formed
18 of two parts: a plurality of mobile communication devices and a back end server. In one
19 of the plurality of mobile communication devices (such as a WAP-enabled phone and a
20 PDA), the user inputs a geo-related text. The geo-related text inputted by the user is
21 formalized into a vector of geo-indicators ($Gi-1, Gi-2, \dots, Gi-n$) by a geoindicator
22 generator 202. The generated geo-indicators ($Gi-1, Gi-2, \dots, Gi-n$) are transmitted to a
23 back end server via a wireless channel. In the back end server, geo-location generating
24 means 203 generates a candidate feature set (CFS) for each geo-indicator by applying
25 geocoding. The geo-location generating means maps the text address to a geo-location
26 based on the back end spatial database. Each CFS is labeled with a confidence level
27 according to the corresponding CF data set in the spatial database. Clustering means 204

1 geoclusters the candidate feature set. CFS could be a set of points determined by an
2 abbreviated building name, a set of lines determined by an abbreviated road name, or a
3 polygon determined by a postal code or a prefix of a telephone number which always
4 show regional characteristics. The clustering means 204 takes into account the geometry
5 relationship (such as distance, contain, intersect, etc.) and confidence level when
6 geoclustering the candidate feature set. The final geo-location information is determined
7 by the back end server, and is transmitted to the user of the mobile device via a wireless
8 channel.

9 Fig.3 is a flow chart illustrating a process of locating position for a mobile
10 communication device according to another advantageous embodiment of the present
11 invention. A user may input one geo-indicator which implies multiple locations. It's a
12 usual case in Chinese abbreviations. In such a case the user's choice may be feedback, the
13 geomarching engine then can refine its geoindicator dictionary. For instance, it can add
14 new indicators, index the geoindicator dictionary with the frequency of being used in
15 history, or even provide a tailored dictionary for each user respectively. The feedback
16 mechanism makes geomarching engine more intelligent and adaptable to locate users
17 more precisely. As shown in Fig.3, if the system determines the generated geo-location
18 information is not unique at step S308, then the user either makes a choice or inputs an
19 additional geo-indicator.

20 The method and system for locating positions for a mobile communication device in
21 mobile commerce according to the present invention have well addressed the
22 position-locating issue in a mobile device context especially for mobile phone based on
23 geocoding and spatial database technologies. The method and system for locating
24 positions for a mobile communication device according to the present invention have
25 many advantages. First, it is obviously showed that two geo-indicators combination, only
26 need several key strokes in mobile phone, could locate an exact position with a high

1 probability. However, achieving the same result in a mobile phone with Chinese character
2 input support means time consuming task of inputting PinYin which requires lots of
3 strokes. Secondly, new type of geo-indicator can be plug into system for a specific
4 application context. For example, a type sticked geo-indicator which not only includes
5 the name of the feature but also the type, e.g., hotel, shop, hospital. These kinds of
6 geo-indicators will definitely improve the confidence level of the CFS derived from it.
7 Thirdly, the result feature position is precise enough in mobile commerce environment,
8 e.g., location-dependent advertising, traffic information and answers to kinds of "how can
9 I go to ... ?" questions. At last, LBT over PvC devices requires no cost at the client side
10 and almost no learning curve. From the cost perspective, it can be adapted to all kinds of
11 devices equipped with a dial pad. In conclusion, LBT is a practical approach to position
12 locating in a mobile commerce context where position of the user is basic data for
13 providing PDIS. Various changes and modifications may be made without departing
14 from the scope and spirit of the present invention. It should be understood that the present
15 invention is not limited to the specific embodiments, and the scope of the present
16 invention is defined by the appended claims.

17 The present invention can be realized in hardware, software, or a combination of
18 hardware and software. A visualization tool according to the present invention can be
19 realized in a centralized fashion in one computer system, or in a distributed fashion where
20 different elements are spread across several interconnected computer systems. Any kind
21 of computer system - or other apparatus adapted for carrying out the methods and/or
22 functions described herein - is suitable. A typical combination of hardware and software
23 could be a general purpose computer system with a computer program that, when being
24 loaded and executed, controls the computer system such that it carries out the methods
25 described herein. The present invention can also be embedded in a computer program
26 product, which comprises all the features enabling the implementation of the methods

1 described herein, and which - when loaded in a computer system - is able to carry out
2 these methods.

3 Computer program means or computer program in the present context include any
4 expression, in any language, code or notation, of a set of instructions intended to cause a
5 system having an information processing capability to perform a particular function
6 either directly or after either conversion to another language, code or notation, and/or
7 reproduction in a different material form.

8 Thus the invention includes an article of manufacture which comprises a computer usable
9 medium having computer readable program code means embodied therein for causing a
10 function described above. The computer readable program code means in the article of
11 manufacture comprises computer readable program code means for causing a computer to
12 effect the steps of a method of this invention. Similarly, the present invention may be
13 implemented as a computer program product comprising a computer usable medium
14 having computer readable program code means embodied therein for causing a function
15 described above. The computer readable program code means in the computer program
16 product comprising computer readable program code means for causing a computer to
17 effect one or more functions of this invention. Furthermore, the present invention may be
18 implemented as a program storage device readable by machine, tangibly embodying a
19 program of instructions executable by the machine to perform method steps for causing
20 one or more functions of this invention.

21 It is noted that the foregoing has outlined some of the more pertinent objects and
22 embodiments of the present invention. This invention may be used for many
23 applications. Thus, although the description is made for particular arrangements and
24 methods, the intent and concept of the invention is suitable and applicable to other
25 arrangements and applications. It will be clear to those skilled in the art that

1 modifications to the disclosed embodiments can be effected without departing from the
2 spirit and scope of the invention. The described embodiments ought to be construed to be
3 merely illustrative of some of the more prominent features and applications of the
4 invention. Other beneficial results can be realized by applying the disclosed invention in
5 a different manner or modifying the invention in ways known to those familiar with the
6 art.

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